

Rogers Cory Partnership		Page 0
The Old School Old School Road Hook Hampshire RG27 9NJ		
Date 26/07/2021 12:14 File SW2-FEH REVIEW.MDX		
Designed by Tim K Checked by Terry S		
Innovyze		Network 2017.1.2

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Net 2

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 489800 99500 SZ 89800 99500
Data Type	Catchment
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	10
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm - Net 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	13.258	0.023	576.4	0.000	5.00	0.0	0.600	o	600	Pipe/Conduit	
S2.000	8.721	0.039	223.6	0.048	5.00	0.0	0.600	o	600	Pipe/Conduit	
S3.000	13.307	0.023	578.6	0.124	5.00	0.0	0.600	o	600	Pipe/Conduit	
S3.001	32.843	0.056	586.5	0.018	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.002	13.364	0.023	581.0	0.014	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.003	56.843	0.097	586.0	0.050	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	-11.50	5.22	4.071	0.000	0.0	0.0	0.0	1.01	284.7	0.0
S2.000	-11.79	5.09	4.167	0.048	0.0	0.0	0.0	1.62	459.3	0.0
S3.000	-11.49	5.22	4.448	0.124	0.0	0.0	0.0	1.01	284.2	0.0
S3.001	-10.40	5.77	4.425	0.142	0.0	0.0	0.0	1.00	282.3	0.0
S3.002	-10.01	5.99	4.369	0.156	0.0	0.0	0.0	1.00	283.6	0.0
S3.003	-8.65	6.94	4.346	0.206	0.0	0.0	0.0	1.00	282.4	0.0

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<u>Manhole Schedules for Storm - Net 2</u>										
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
S75	5.752	1.681	Open Manhole	1500	S1.000	4.071	600			
S73	7.270	3.103	Open Manhole	1500	S2.000	4.167	600			
S66	6.560	2.112	Open Manhole	1500	S3.000	4.448	600			
S67	6.512	2.087	Open Manhole	1500	S3.001	4.425	600	S3.000	4.425	600
S68	6.058	1.689	Open Manhole	1500	S3.002	4.369	600	S3.001	4.369	600
S69	6.168	1.822	Open Manhole	1500	S3.003	4.346	600	S3.002	4.346	600
S70	6.740	2.491	Open Manhole	1500	S3.004	4.249	600	S3.003	4.249	600
S71	6.916	2.697	Open Manhole	1500	S3.005	4.219	600	S3.004	4.219	600
S72	7.142	2.962	Open Manhole	1500	S3.006	4.180	600	S3.005	4.180	600
S74	6.200	2.072	Open Manhole	1500	S2.001	4.128	600	S2.000	4.128	600
								S3.006	4.128	600
S80	6.530	2.459	Open Manhole	1500	S4.000	4.071	600			
S76	7.500	3.454	Open Manhole	2100	S1.001	4.096	600	S1.000	4.048	600
								S2.001	4.096	600
								S4.000	4.046	600
S77	7.500	3.426	Open Manhole	2100	S1.002	4.074	600	S1.001	4.074	600
S78	5.500	1.471	Open Manhole	1500	S1.003	4.029	600	S1.002	4.029	600
S79	5.500	1.481	Open Manhole	2100	S1.004	4.019	600	S1.003	4.019	600
S80	5.500	1.489	Open Manhole	0		OUTFALL		S1.004	4.011	600
<u>Free Flowing Outfall Details for Storm - Net 2</u>										
Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, I (mm)	W (mm)				
S1.004	S80	5.500	4.011	0.000	0	0				
<u>Simulation Criteria for Storm - Net 2</u>										
Volumetric Runoff Coeff		0.750	Additional Flow - % of Total Flow		10.000					
Areal Reduction Factor		1.000	MADD Factor * 10m³/ha Storage		2.000					
Hot Start (mins)		0	Inlet Coefficient		0.800					
Hot Start Level (mm)		0	Flow per Person per Day (l/per/day)		0.000					
Manhole Headloss Coeff (Global)		0.500	Run Time (mins)		60					
Foul Sewage per hectare (l/s)		0.000	Output Interval (mins)		1					
Number of Input Hydrographs		0	Number of Storage Structures		3					
Number of Online Controls		1	Number of Time/Area Diagrams		0					
Number of Offline Controls		0	Number of Real Time Controls		0					
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<u>Simulation Criteria for Storm - Net 2</u> <u>Synthetic Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FEH</td> </tr> <tr> <td>Return Period (years)</td> <td>2</td> </tr> <tr> <td>FEH Rainfall Version</td> <td>2013</td> </tr> <tr> <td>Site Location</td> <td>GB 489800 99500 SZ 89800 99500</td> </tr> <tr> <td>Data Type</td> <td>Catchment</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> </tr> <tr> <td>Winter Storms</td> <td>No</td> </tr> <tr> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>Storm Duration (mins)</td> <td>30</td> </tr> </table>			Rainfall Model	FEH	Return Period (years)	2	FEH Rainfall Version	2013	Site Location	GB 489800 99500 SZ 89800 99500	Data Type	Catchment	Summer Storms	Yes	Winter Storms	No	Cv (Summer)	0.750	Cv (Winter)	0.840	Storm Duration (mins)	30
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Online Controls for Storm - Net 2

Hydro-Brake® Optimum Manhole: S79, DS/PN: S1.004, Volume (m³): 6.3

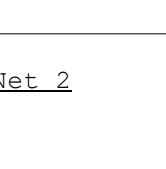
Unit Reference MD-SHE-0079-3000-1200-3000	
Design Head (m)	1.200
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	79
Invert Level (m)	4.019
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.0	Kick-Flo®	0.707	2.4
Flush-Flo™	0.348	2.9	Mean Flow over Head Range	-	2.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.3	1.200	3.0	3.000	4.6	7.000	6.8
0.200	2.8	1.400	3.2	3.500	4.9	7.500	7.0
0.300	2.9	1.600	3.4	4.000	5.2	8.000	7.3
0.400	2.9	1.800	3.6	4.500	5.5	8.500	7.5
0.500	2.8	2.000	3.8	5.000	5.8	9.000	7.7
0.600	2.7	2.200	4.0	5.500	6.1	9.500	7.9
0.800	2.5	2.400	4.1	6.000	6.3		
1.000	2.8	2.600	4.3	6.500	6.6		

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Storage Structures for Storm - Net 2

Tank or Pond Manhole: S75, DS/PN: S1.000

Invert Level (m) 4.600

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	95.2	1.180	325.6

Tank or Pond Manhole: S80, DS/PN: S4.000

Invert Level (m) 4.121

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	140.0	0.400	140.0	0.410	0.0

Tank or Pond Manhole: S78, DS/PN: S1.003

Invert Level (m) 4.167

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	67.6	1.333	263.5

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Net 2

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 489800 99500 SZ 89800 99500
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	30, 100
Climate Change (%)	0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S75	1440 Winter	30	+0%	30/120 Winter			
S2.000	S73	1440 Winter	30	+0%	100/60 Summer			
S3.000	S66	1440 Winter	30	+0%	100/120 Winter			
S3.001	S67	1440 Winter	30	+0%	100/120 Winter			
S3.002	S68	1440 Winter	30	+0%	100/120 Summer			
S3.003	S69	1440 Winter	30	+0%	100/60 Summer			
S3.004	S70	1440 Winter	30	+0%	100/60 Summer			
S3.005	S71	1440 Winter	30	+0%	100/60 Summer			
S3.006	S72	1440 Winter	30	+0%	100/60 Summer			
S2.001	S74	1440 Winter	30	+0%	30/240 Winter			
S4.000	S80	1440 Winter	30	+0%	30/120 Winter			
S1.001	S76	1440 Winter	30	+0%	30/180 Winter			
S1.002	S77	1440 Winter	30	+0%	30/180 Winter			
S1.003	S78	1440 Winter	30	+0%	30/120 Winter			
S1.004	S79	4320 Summer	30	+0%	30/120 Winter	100/1440 Winter		

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<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Net 2</u>									
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S75	4.768	0.097	0.000	0.01		1.0	SURCHARGED	
S2.000	S73	4.765	-0.002	0.000	0.00		0.8	OK	
S3.000	S66	4.774	-0.274	0.000	0.02		2.1	OK	
S3.001	S67	4.774	-0.251	0.000	0.01		2.3	OK	
S3.002	S68	4.773	-0.196	0.000	0.02		2.3	OK	
S3.003	S69	4.772	-0.174	0.000	0.01		3.1	OK	
S3.004	S70	4.771	-0.078	0.000	0.02		2.8	OK	
S3.005	S71	4.770	-0.049	0.000	0.02		3.1	OK	
S3.006	S72	4.769	-0.011	0.000	0.01		2.9	OK	
S2.001	S74	4.765	0.037	0.000	0.04		7.3	SURCHARGED	
S4.000	S80	4.764	0.093	0.000	0.01		1.5	SURCHARGED	
S1.001	S76	4.764	0.068	0.000	0.02		6.1	SURCHARGED	
S1.002	S77	4.762	0.088	0.000	0.03		5.8	SURCHARGED	
S1.003	S78	4.769	0.140	0.000	0.02		4.4	SURCHARGED	
S1.004	S79	5.025	0.406	0.000	0.01		2.9	SURCHARGED	
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Net 2

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
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Analysis Timestep	Fine	Inertia Status	ON
DTS Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
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S3.000	S66	1440 Winter	100	+40%	100/120 Winter			
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S3.002	S68	1440 Winter	100	+40%	100/120 Summer			
S3.003	S69	1440 Winter	100	+40%	100/60 Summer			
S3.004	S70	1440 Winter	100	+40%	100/60 Summer			
S3.005	S71	1440 Winter	100	+40%	100/60 Summer			
S3.006	S72	1440 Winter	100	+40%	100/60 Summer			
S2.001	S74	1440 Winter	100	+40%	30/240 Winter			
S4.000	S80	1440 Winter	100	+40%	30/120 Winter			
S1.001	S76	1440 Winter	100	+40%	30/180 Winter			
S1.002	S77	1440 Winter	100	+40%	30/180 Winter			
S1.003	S78	1440 Winter	100	+40%	30/120 Winter			
S1.004	S79	480 Winter	100	+40%	30/120 Winter	100/1440 Winter		

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